International Student Projects - How to make it happen

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International Student Projects
How to make it happen

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ABSTRACT
The students we educate today are going to work in a globalized world: Even if located in one country, often work is done in diverse teams that spans background, cultures and geographical borders. An important way to prepare our students for this globalized workplace is to have students working exactly this way, making projects with students from other countries and with other backgrounds. However, this is easier said than done, even if good intentions are present: Different traditions on project work and collaborations, different formal and informal requirements, timing, accreditation and simply managing these complexities. In this paper, we present an approach to overcome these challenges in a setting of mixing physical and virtual collaboration, along with the evaluations received from students, teachers and industrial partners. We discuss the challenges we have identified, and how these can be overcome. The paper is inspired by experiences from the Erasmus+ Strategic Partnership EPIC (Improving Employability Through Internationalization and Collaboration), which is a flexible framework for collaborative student projects. It targets university teachers and supervisors and other staff working with internationalisation such as program responsible and international coordinators. Conclusively, the value of student collaborations across cultural and academic differences involving both partners from industry and academia is demonstrated. Challenges associated with the proposed approach of EPIC are outlined and a proposal for refining the concept to overcome said challenges is presented.

Keywords - Problem Based Learning, Student Projects, Internationalisation, Cross-Disciplinary.
Contribution – Explore session.

I INTRODUCTION

The students we educate today are going to work in a globalized world: Even if located in one country, often work is done in diverse teams that span background, cultures and geographical borders. An important way to prepare our students for this globalized workplace is to have students working exactly this way, making projects with students from other countries and with other backgrounds. This can happen in the same physical location, but it can also be taken to another level by students collaborating on e.g. mini projects, semester projects or thesis projects even if located in different places.

The need for students being able to work in diverse environments and being able to understand real-world problems is clearly identified in the Agenda for the Modernisation of Higher Education (European Commission, 2011) – a new and updated Agenda is currently being written, but this focus on transversal competences is unlikely to change. Previous projects in the field such as the COLIBRI project (Pedersen et. al, 2017), (COLIBRI website, 2018) has also demonstrated how students, staff and industrial partners all see a strong value in training such skills through joint student projects. In the COLIBRI project, during the last year 93% of the students found that participating in the course had made them better prepared for the international labour market (to a moderate or major extend), and 79% of the students found the course had made them better prepared for the national labour market (to a moderate or major extend).

The EPIC project, Improving Employability Through Internationalization and Collaboration, (EPIC website, 2018) is a 3-year Erasmus+ Strategic Partnership, where a flexible framework for setting up and carrying out student projects is explored. Compared to previous projects in the field, the main difference is that these student projects are carried out within existing study regulations, and do not require special arrangements and dispensations. While being scalable, flexible and "doable", it does give some additional practical and pedagogical challenges which need to be addressed (e.g. in terms of group formation, projects starting and ending at different points in time, as well as reporting and evaluation).

In this paper we explore how this can be done concretely, given the opportunities and limitations in the Danish engineering educations, in the whole process of such projects: From getting the initial idea, to matching students and forming groups, to virtual, physical and blended collaboration during the semester and finally evaluation and exam. The goal of the paper is to inspire the participants to do more international student projects and to introduce concrete tools for how this can be done. We also want to demonstrate the hypothesis, namely that such projects are valuable for students and in fact also possible to carry out even within existing studies.

II THE SETTING

As mentioned before, the EPIC project is a 3-year Strategic Partnership funded by the European Commission through the Erasmus+ Programme, running through 2017-2020. Among the partners are eight universities and two companies, spanning over seven countries and geographically representing most of Europe. During the first year, 25 students participated from seven of the universities (AAU contributed the most students since an AAU-group of five students participated, while others contributed just a few students).

The idea behind the project is to develop ways to set up student projects across educational institutions, usually also involving collaboration with companies representing various industries, i.e. through having students working on real-world problems they define. Moreover, the project will deliver materials to support all aspects of the project work: From documenting benefits for the collaborating companies, to methods for setting up the project work, and to teaching and training materials for both students and teachers. However, this paper focuses on how to set up the project work.

The three year duration of the project allows for three independent yearly cycles, where each cycle runs from September to August, and includes preparing the projects, executing the projects during the spring semester, and then evaluating the previous year before developing for the next. New students are selected every year. The goal is to develop methods and materials that can also be used after the project is finished, and therefore it is important that the developed framework for setting up student projects is flexible enough that no hand-held solutions are needed in how legal aspects are handled, and that it is also not too expensive with respect to travelling.

These different aspects of the project work are discussed further in the following sections of the paper. The models and approaches described all reflects upon how it was done during the first yearly cycle of EPIC, but also discusses considerations for changes in the second year.

III PREPARING THE PROJECTS

Setting up student projects across multiple educational institutions spanning over different geographical boarders is more challenging than setting up the projects in just one institution.

One set of challenges is the practical challenge with respect to e.g. different times of semesters, different duration/workload to different students, different learning objectives and other formal requirements, and

different ways of conducting exams. From the beginning, we wanted to avoid all hand-held solutions and dispensations from existing legal frameworks, as this is not scalable/sustainable. Therefore, the process was designed so that:

- All reports and documentation are handed in to the home university of the student and examined and graded according to their regulations. The only additional requirement from participating in EPIC as a student is that all students are required to also submit a joint final report, describing both academic achievements and reflections upon the learning processes involved. This also ensures that all work done in EPIC is properly and formally recognised with ECTS points in their local universities.
- The timing of the projects also follows that of the home universities: Since semesters start and end at different dates, a natural consequence is that not all members of the project groups start/stop at the same time. In practice, most students start the spring semester around February 1, which results in an almost synchronised start, while the ending dates are more spread but also less critical for the collaboration.

Figure 1 describes four different models for project setups. Model 1 is an extreme case with a minimal amount of cross institutional collaboration, where the students work on a joint problem but with separated theses and individual reports. This model is fitting for a project where local university regulations and other complexities created by the diversity of the group, has heavy influence and hinders closer collaboration. Model 4 is an opposite extreme case, where cross institutional collaboration is a leading aspect through all parts of the project. This project model requires of the students to delegate contributions to and responsibilities for the joint thesis through evaluation of individual qualifications. Obstacles caused by communicative challenges, academic or cultural differences and general disagreements are expected to occur, but the philosophy of EPIC, is that these obstacles resembles situations in the global labour market and ultimately helps to better prepare the students. Models 2 and 3 offer group variants dominated by a combination of shared and individual elements contributing to the flexibility of EPIC.

In all cases, the students will also finish with a joint report describing both academic achievements and reflections on the learning process.

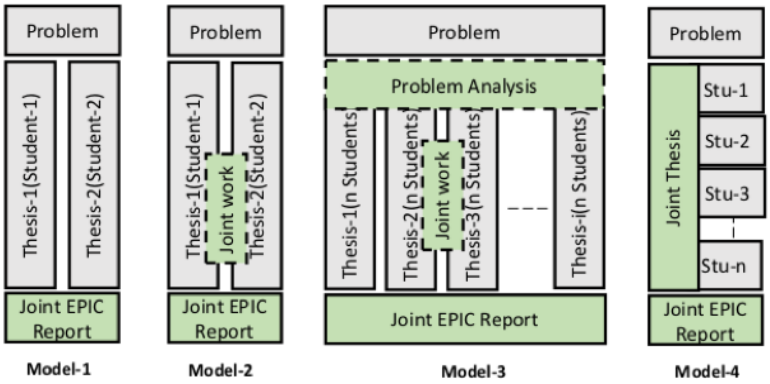

Figure 1: The four different models for joint student projects

The other set of challenges is related to the matching between interests of the industry, students' interests, students' backgrounds, and academia interests. We found this to be rather challenging, in particular due to a number of observations:

- There are different timings of topic/project selection processes in the different institutions, and sometimes these processes make it hard to handle situations where a project cannot be confirmed at their selection deadline. For example, the deadline for alternative options might be closed by the time all students in EPIC have indicated their project wishes. As an example, students from

one institution had to choose their master thesis topics in early December and have them approved before Christmas. On the other hand, students from another institution would usually not select their topics until the beginning of the semester.

- On the other hand, it was not possible for us to guarantee students that they could work on a specific topic until we knew that a sufficient number of students would choose these (in particular, we wanted all projects to have students from at least two different countries).
- One complexity that we have not really resolved deals with traditions in some countries, where students are often paid for collaborating with companies on e.g. master thesis projects. In this case, the company often has some procedures for accepting students, e.g. applications or interviews. In EPIC we have decided not to take hand of this. We also do not have a universal view on IPR/publication rights, but leave this to the involved institutions; However, the report produced especially for EPIC is made publicly available.

In practice, this was handled by defining a process, where each institution would team up with relevant companies (sometimes also across institutions) and propose project proposals together. Once these were published, students could apply to participate in EPIC with a prioritized list of topics, which would give us some flexibility in ensuring which projects to run. We would then confirm to the students as soon as there were students from more than two countries who had selected a project, and in the case of projects with students from only one country we would discuss with the teachers of the institutions that had not yet selected their students whether we would be almost certain to have applications for these topics. While being somewhat cumbersome to administrate, it actually worked out well, even in the case of uncertainties and last-minute changes that always happen. However, it was also a process that somewhat violated some of the usual procedures for project selection and group formation in the involved institutions: For example, for Computer Engineering students at Aalborg University, the group formation and project selection process is always taking place on the first day of the semester, where all students on the same semester meet, are introduced to project proposals, and then have to form the groups based on some requirements to minimum and maximum group sizes: As a general rule, no group is formed before all groups are formed. This dynamic is changed a lot when one group is formed months ahead, and before alternative project proposals are even known.

Another challenge with the process described is that the time from “idea” to “project realisation” becomes quite long. The dialogues with companies take place already in September-October, while the project does not start until February. This is a much longer process than in Aalborg University, where the ideas for spring project proposals are usually defined shortly before the semester start, e.g. December or January. For this reason, and also to accommodate other good ideas, it was also possible for the institutions to define projects through a “fast track”, where students could be matched to a good idea – for example, when it turned out that master thesis students from both Aalborg and Riga where working on similar topics, they could also benefit from becoming part of EPIC.

In this paper we will not deal so much with the other aspects of preparing the stakeholders (students, teachers and company representatives) to the project work, but just mention that this was done through e.g. a set of online materials that all were supposed to follow before the project itself started.

IV THE PROJECT WORK

In this section we will present how the projects were carried out. Figure 2 provides an overview of this process: Each yearly project cycle in the EPIC collaboration involves a mixture of physical and virtual collaboration. The project work as such is inspired by the Aalborg model for Problem Based Learning (Kolmos et. al, 2004), but adapted to the different setup and contexts.

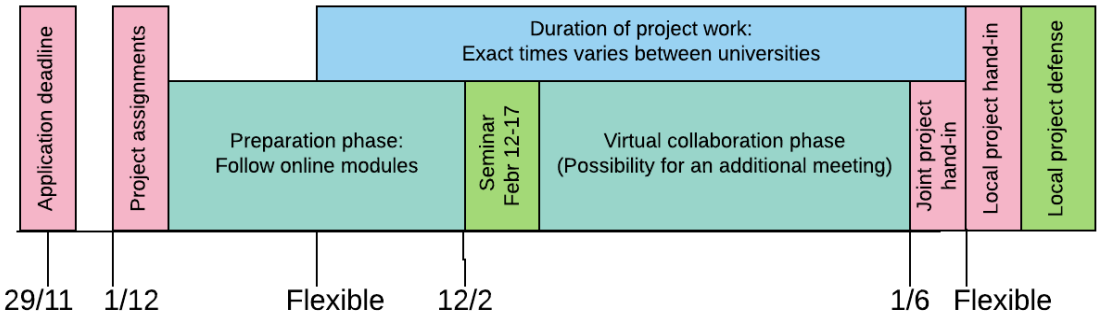

Figure 2: Timeline for the project work during the first year of EPIC

As can be seen in Figure 2, the project start is flexible – something that reflects the different semesters in the different countries. In principle, the project assignments were supposed to be in place by December 1, but in reality, this was not always possible and in fact the last students were confirmed around February 1. The online modules we mentioned previously would be the first part of EPIC that the students experience. These are partly focusing on teamwork and project management of diverse and virtual teams, and partly on content that is expected to be relevant for all the students.

In the next step, all participating students physically meet up with each other and representatives from all academic and industrial partner institutions, at an introductory seminar. The purpose of this seminar is that all project groups leave with a clear vision for the structure of the work to come, their responsibilities towards each other as well as the requirements for the academic work related to their respective local universities and their part-taking in the EPIC project. During this period students are instructed in tools relevant to problem solving and online communication, with purpose to supply everyone with the necessary toolbox before the online collaboration phase starts. This involves workshops and lectures within themes as effective use of online communication tools, file sharing and parallel development methods.

The next part is virtual: Throughout this the students are provided with both academic and industrial guidance, to ensure real-life-perspective and fulfillment of requirements for both perspectives. Depending on the group model chosen to fit a specific project group, the collaborative aspects differ in many areas. All four models have the initial problem definition phase and the final joint EPIC-hand-in as obligatory. But the perspective taken on the online collaboration phase differs greatly depending on the model in use. For model 1 and model 2, the actual project work is directly in parallel and the involved students primarily acts as sparring partners working on the same problem. Model 3 and model 4, depends on more on in-depth collaboration, with either a joint problem analysis phase followed by tightly connected project work, or a joint process from beginning to end. In the first year of EPIC the size of groups ranged from two students working together on their thesis projects, to 9 students from four different universities working together. In the latter case, the students were all working at different levels (from 2nd semester to 6th semester) and different amounts of ECTS (from 8 to 25). Table 1 provides an overview of the groups and themes of the student projects of the first year. Needless to say, the format of group work was very different in these different cases.

During the virtual phase, all groups had the possibility to arrange an additional physical meeting with the Erasmus+ funding. However, due the Erasmus+ funding rules it is a requirement that such a visit comprises of at least five working days, which can make it hard to fit into a schedule that also includes other courses. The groups would meet at different times and places, so that each group could fit it into their project plans and schedules, and it would be held in one of the institutions involved in the project – also to minimize travel costs. The plan for the week was made by the groups together with supervisor(s) to

fit their needs – much of the value being the ability to sit and work together for a week. Three of the groups chose to do so, and as described below found this to be very beneficial for the project work. We would add that especially for the larger group, this additional seminar was crucial for the successful completion of the project.

Table 1: The projects carried out during the first year of EPIC

Topic/Research area	Leading University	Students involved
E-Commerse (food logistic)	Stavanger	3
Facility Management	Bydgoszcz	3
Logistic	Hamburg	2
Honeyjar (malware studies)(4 subgroups)	Aalborg	9
Mobile app for funding research	Atene Kom (company)	2
Security for IoTs	Riga	3
Energy Dash Board	Saxion	3

The joint project hand-in deadline was set to be June 1, as around this time the first students have to deliver their projects to the home universities. This choice also means that some students with a later local hand-in date would have additional time to work on their parts. In reality, this was administrated with some flexibility, so a suitable deadline was negotiated for all the groups. The joint EPIC report was assessed and led to the students receiving an EPIC certificate in addition to the recognition of the work at their home universities.

V EVALUATION AND RESULTS

Throughout the yearly cycle, both quantitative and qualitative evaluations were carried out among students, teaching staff and company representatives. This section presents some of the most interesting results and observations related to the project work. We also present some of our own observations which are well in line with the comments received from both students, teachers and companies.

First of all, we will present some of the quantitative evaluations received. The general evaluations from the students are presented in Figure 3, and the general evaluations from the teachers in Figure 4. The scores are on a scale from 1-5, where 5 is the highest level of satisfaction. We see that most students are very satisfied and believe the EPIC project has been good for their studies and career. This is confirmed in additional more detailed questions, which we have not included here due to space limitations. The responses from the teachers are similarly positive.

The students also evaluated the mobilities, both the initial project seminar and the additional blended mobility that three of the groups had. This was done on a scale from 1 to 4 (“bad” to “excellent”) and the results are presented in Figures 5-6. In general, the students are happy with both seminars: In fact, all students found that both seminars helped them with the project work to an either good or excellent extend. However, it is remarkable that on most parameters the second mobility (which is not mandatory) receives higher scores than the initial mobility (which we consider to be mandatory). We believe this is largely due to the fact that the students after working together online, and after working with the subjects for some

time, are better prepared for the academic activities. Both authors of this paper were present for the second seminar of the large group (Honeyjar) and can confirm that it was a very productive week: The ability to discuss face-to-face, and to use whiteboards for discussions, was of extreme value. Also, the fact that the students were together, being able to focus on the project for a full week without other interruptions was part of the positive experience.

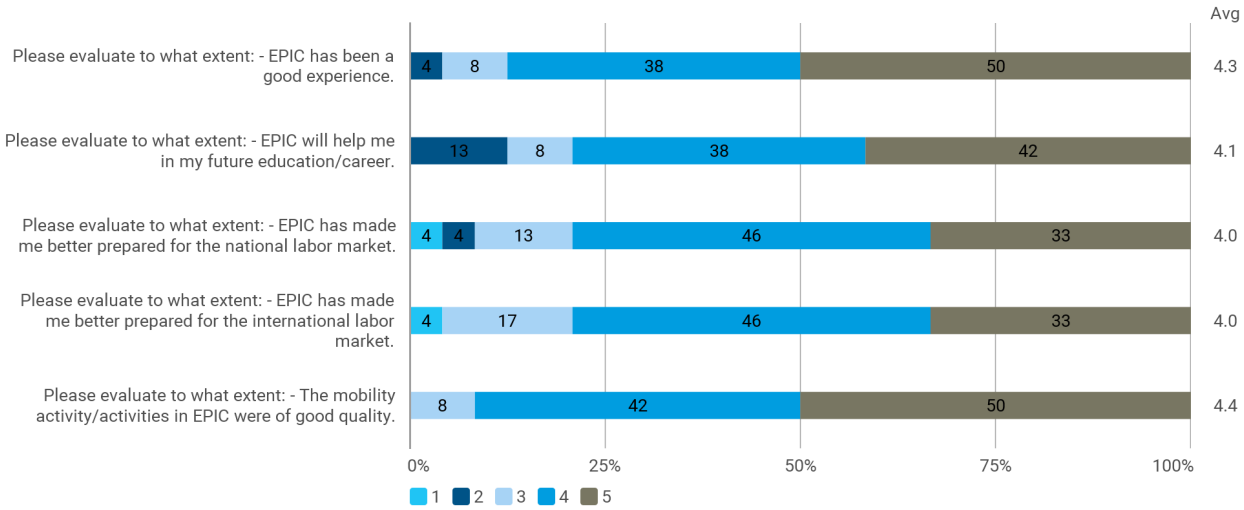

Figure 3: Students evaluation of EPIC year 1. The scale is 1-5, where 1=”Not at all” and 5=”Very much”.

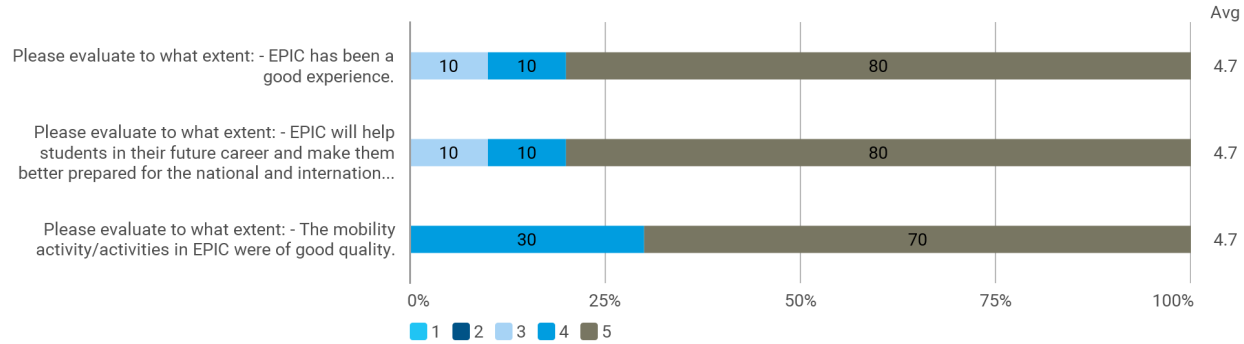

Figure 4: Teachers evaluation of EPIC year 1. The scale is 1-5, where 1=”Not at all” and 5=”Very much”.

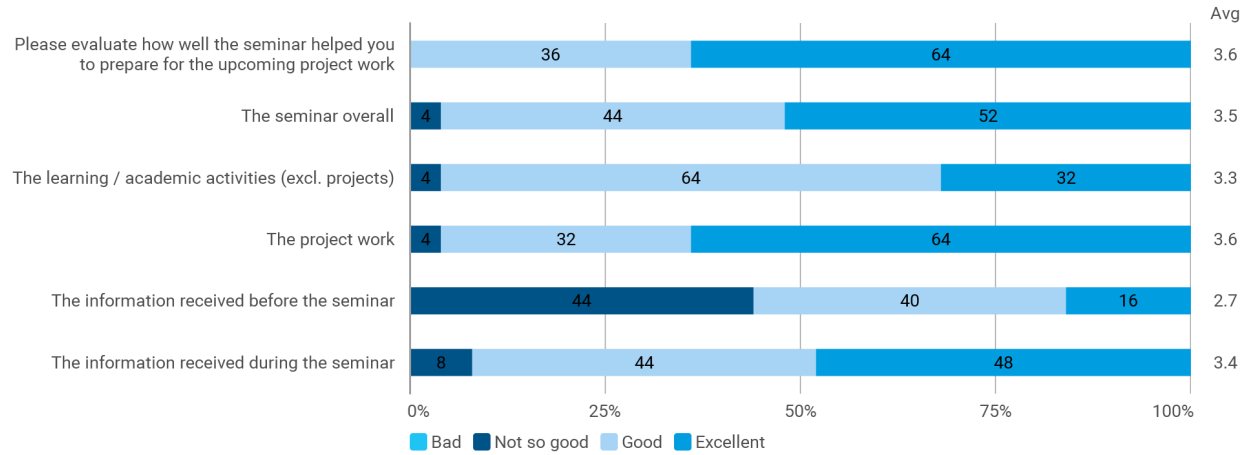

Figure 5: Students evaluation of the project seminar (the average is based on a 1-4 scale, 4 being excellent).

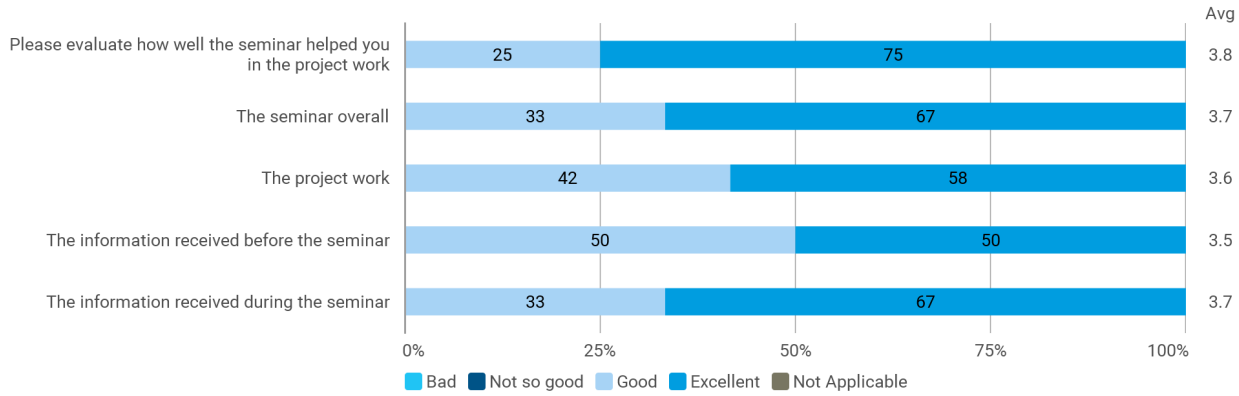

Figure 6: Students evaluation of the second blended mobility (not all students participated).

Based on the qualitative comments received in the evaluations, as well as our own observations, we would like to add the following comments:

- Staying within existing study regulations come with advantages in terms of sustainability and scalability: This can actually be done also outside of our Erasmus+ Strategic Partnership, and even when the project is over and the funding no longer available. It also ensures that the students receive recognition and ECTS points for the work done, which is what really makes it an integrated part of their studies. On the other hand, some of the projects especially in larger groups, also give the students some additional work related to project planning and setup: While this is exactly what provides the students with competences related to real-world problem solving, international collaboration, and interdisciplinary work, this does take time away from the disciplinary academic learning. It varies from country to country to what extend these learning objectives are counted and assessed during the evaluation of the work, and we could wish that these were more formally included in the learning objectives to ensure recognition – otherwise, students who simply aim for good grades might not find these learning activities attractive.
- The project seminar denotes the kick-off of the project. By starting "from scratch" it ensures that the groups have a common understanding of the project scope and goals, and supervisors from both academia and industry can help defining the right scope from the beginning and clarify any uncertainties. Initially, it also seemed that all groups got a good start of the project, and left the seminar with clear visions and plans. However, very often the first part of the project period would be to study the background and context of the problems to work on, and in many cases this new knowledge resulted in a need for adjusting content and time plans. It turned out that these adjustments could be difficult to do based on virtual collaboration. Therefore, it should be considered if enabling the students to be better prepared for the project seminar would help them in ensuring that they can leave the seminar with a more robust scoping and plan. We also saw in the evaluation of the project seminar that satisfaction with the activities increased day by day: We find this to confirm that it was during this week the students really found out what the project was all about, suggesting that a better preparation would have been beneficial.
- Some groups found that the different supervisors would try to get them to work in different directions, and also observed that the objectives of EPIC were not always aligning with the objectives of the project to be delivered at their home universities. While this is in line with the above point on staying within existing study regulations, it could demonstrate a need for clarifying more precisely the different roles of the different supervisors (company supervisor, local supervisor and EPIC supervisor). On the other hand, having supervisors with different points of view can also be a strength as the students are presented with different perspectives.
- Finally, we note that despite the challenges identified both students, teachers and company representatives are overall showing a high degree of satisfaction with the project.

On a final note, we would like to present some of the quotes from the student evaluations, which both demonstrate the value of doing international student projects, but also highlights some points that could be improved, especially when it comes to the role of the industrial partners.

- "Initiates like this are a great way for students to explore different cultures and work with people you would've otherwise never worked with. Thank you."
- "EPIC on a whole was a great experience, I had developed an eye for industrial problem solving. The only suggestion from my side is that, please make sure that the industry is willing to assist the project completely and also make sure a clear project proposal is identified before taking up the projects."
- "I am happy to partake in this project, I had the exposure to finally apply what I learnt in school. This is the best experience since I started studying in Europe. However, there should be more commitment from the organisations student works with, these companies should provide as much as possible information to the students and the student should be added to the companies' in house research team."

VI DISCUSSION AND CONCLUSIONS

The diversity brought by the globalization involves challenges of cultural and academic proportions. Establishing a collaboration across geographical and virtual boarders creates communicative, professional and humane challenges. Applying these challenges to a collaboration involving industrial partners and the established educational environment, where differences in local university regulations and predefined deadlines is inevitable, requires a well-structured approach. The complexity brought as a result of diversity resembles the global labour market. EPIC acts under the philosophy that introducing students to real-world challenges early in their educational careers is an important step in preparing them to enter the global labour market.

Collaborating across cultural and academic differences requires a structured methodology for effectively managing the project work. In pursuit of addressing the diversity while creating a solid framework for students to base their project work on, the EPIC partners have developed four proposals for structuring the group-based project work. All models take point of departure in Problem-Based learning methods, which requires of the students to locate a problem worth solving and in collaboration with academic and industrial supervisors develop a thorough strategy for the consequent work.
In this paper we have demonstrated the value of having students working on projects across countries and disciplines. We have also outlined some of the challenges that comes with this approach, especially when working with the constraints that we want to stay within the limitations of existing legal frameworks without dispensations and hand-held solutions. The models introduced are flexible and pragmatic and shows that it is possible to overcome the challenges identified.

During the next years we will continue polishing the models, especially focusing on the following aspects:

- Making the students better prepared for the first seminar, so they can get an even better start on the project work. As a first step, it is necessary to have all students on board at an earlier stage, and also to appoint supervisors early on. This will make it possible for the supervisors together with the company/companies to identify relevant materials that the students can study on beforehand, so they have more background knowledge when showing up for the project seminar. We believe this will support having more qualified discussions on content during the seminar, reducing the need for re-scoping later on).
- Another effort to improve the project start is to create a booklet describing the profile of all participants, both teachers, students, and company representatives. By introducing this prior to the

project seminar it becomes possible for the students to be not only prepared on the academic aspects, but also on the profiles in the groups. Also, it will provide a useful overview of the profiles of different teachers, so the students can identify relevant profiles for questions and inputs both during the seminar and for the rest of the project period.

- We will work on equipping the supervisors better to take on the supervisor role(s) with a special focus on the roles of the different supervisors from companies, local universities, and the EPIC supervisor. It is our experience that terms like "project work" and "supervisor" can have very different meaning in different educational contexts, and while we do not think these should be standardized some common agreements about supervision would be beneficial: Especially, we should equip both supervisors and students to be explicit about wishes and expectations to each other.
- Finally, we will also try to adjust the process for project selection, as to make it more structured and with less ad-hoc solutions. The main idea is that students instead of selecting specific project proposals can select to work within a theme, where each theme consists of a number of different project proposals. This will allow some more flexibility when assigning students to projects. On the other hand, we also want to remain flexible and able to adjust to specific wishes from students and companies.

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BIOGRAPHICAL INFORMATION

Jens Myrup Pedersen is Associate Professor at Department of Electronic Systems, Aalborg University. In addition to his research in the fields of computer networks and cyber security, he has a strong interest in Problem Based Learning, especially in international and interdisciplinary contexts, and in digitally supported learning. He has been coordinating a number of Erasmus and Erasmus+ projects and is currently coordinator of the EPIC project.

Jacob Vejlin Jensen is a student of Computer Engineering at Aalborg University, Aalborg, Denmark. He is actively involved in the EPIC project, first as a student, and after that as a student helper. He has acquired experience with international studies, Problem Based Learning, and cross disciplinary work. In EPIC he was part of the 9-person group working with Honeyjar (malware studies).